FIG.1

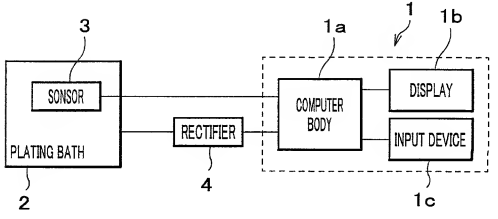
3
1
1a
1b
SONSOR
COMPUTER BODY
DISPLAY
RECTIFIER
INPUT DEVICE
PLATING BATH
2
4
1c

FIG.2

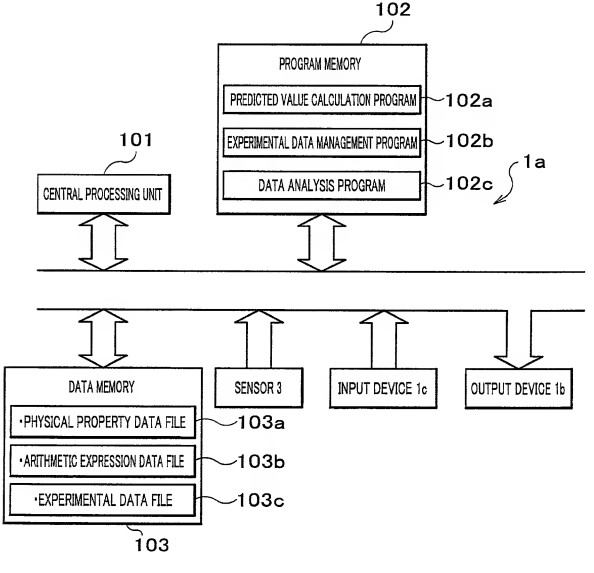
102
PROGRAM MEMORY
PREDICTED VALUE CALCULATION PROGRAM
102a
EXPERIMENTAL DATA MANAGEMENT PROGRAM
102b
DATA ANALYSIS PROGRAM
102c
1a
101
CENTRAL PROCESSING UNIT
DATA MEMORY
SENSOR 3
INPUT DEVICE 1c
OUTPUT DEVICE 1b
•PHYSICAL PROPERTY DATA FILE
103a
•ARITHMETIC EXPRESSION DATA FILE
103b
•EXPERIMENTAL DATA FILE
103c
103

FIG.3

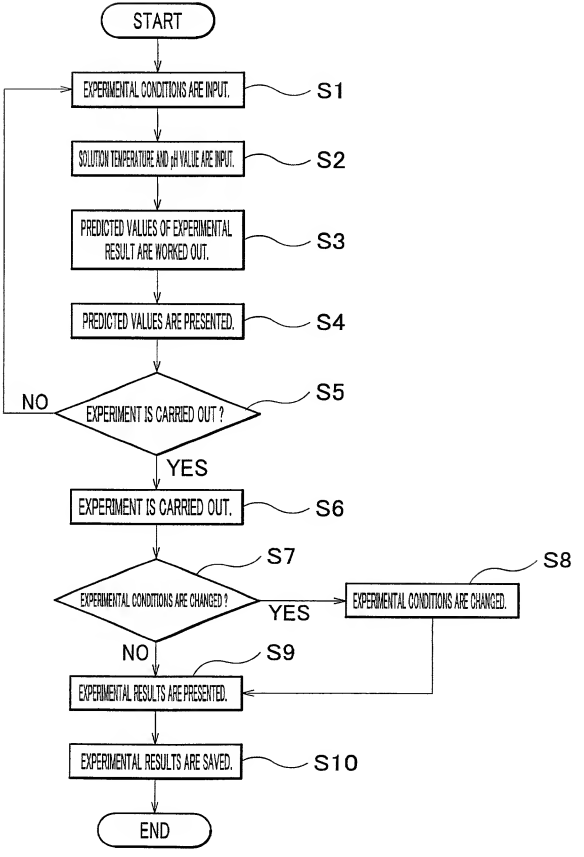
START
EXPERIMENTAL CONDITIONS ARE INPUT.
S1
SOLUTION TEMPERATURE AND pH VALUE ARE INPUT.
S2
PREDICTED VALUES OF EXPERIMENTAL RESULT ARE WORKED OUT.
S3
PREDICTED VALUES ARE PRESENTED.
S4
NO
EXPERIMENT IS CARRIED OUT ?
S5
YES
EXPERIMENT IS CARRIED OUT.
S6
S7
EXPERIMENTAL CONDITIONS ARE CHANGED ?
YES
S8
EXPERIMENTAL CONDITIONS ARE CHANGED.
NO
S9
EXPERIMENTAL RESULTS ARE PRESENTED.
EXPERIMENTAL RESULTS ARE SAVED.
S10
END

FIG.4

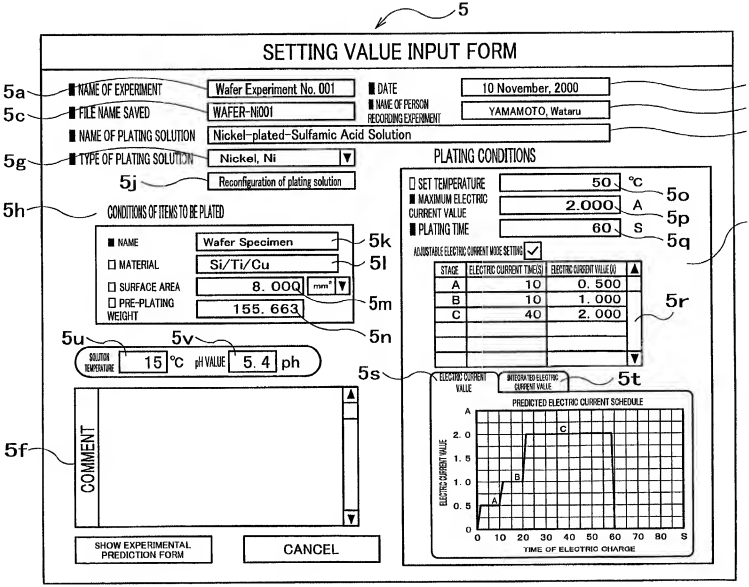

FIG.5A

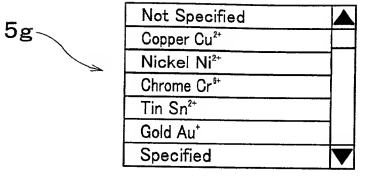

FIG.5B

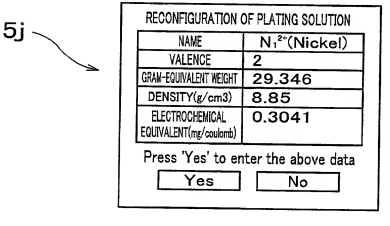

FIG.5C

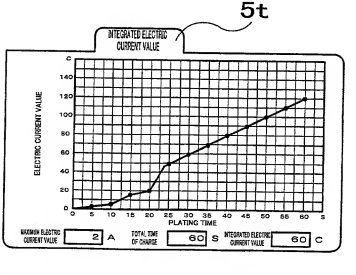

FIG.6

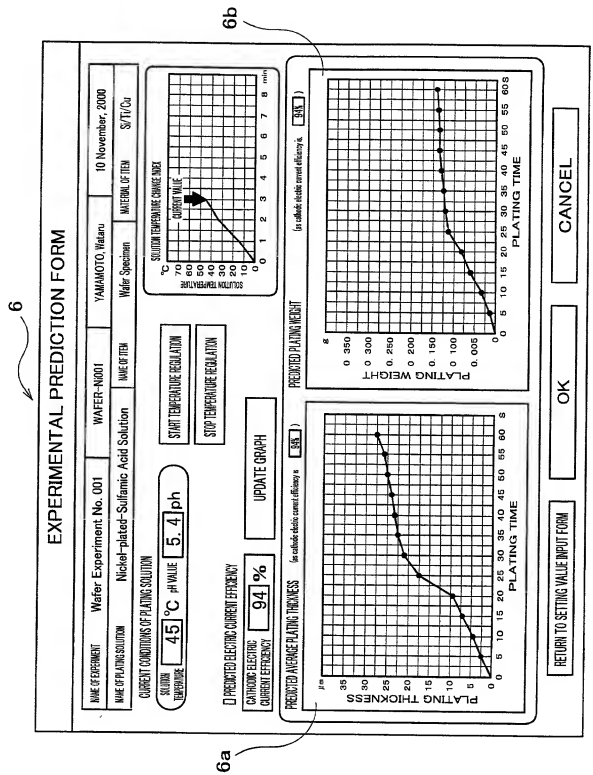
6
6a
6b
EXPERIMENTAL PREDICTION FORM
NAME OF EXPERIMENT
Wafer Experiment No. 001
WAFER-Ni001
YAMAMOTO, Wataru
10 November, 2000
NAME OF PLATING SOLUTION
Nickel-plated-Sulfamic Acid Solution
NAME OF ITEM
Wafer Specimen
MATERIAL OF ITEM
Si/Ti/Cu
CURRENT CONDITIONS OF PLATING SOLUTION
SOLUTION TEMPERATURE
45 °C
pH VALUE
5. 4 ph
START TEMPERATURE REGULATION
STOP TEMPERATURE REGULATION
SOLUTION TEMPERATURE CHANGE INDEX
CURRENT VALUE
SOLUTION TEMPERATURE
°C
min
PREDICTED ELECTRIC CURRENT EFFICIENCY
CATHODIC ELECTRIC CURRENT EFFICIENCY
94 %
UPDATE GRAPH
PREDICTED AVERAGE PLATING THICKNESS
(as cathodic electric current efficiency is 94%)
PLATING THICKNESS
μm
PLATING TIME
PREDICTED PLATING WEIGHT
(as cathodic electric current efficiency is 94%)
PLATING WEIGHT
g
RETURN TO SETTING VALUE INPUT FORM
OK
CANCEL

FIG. 7

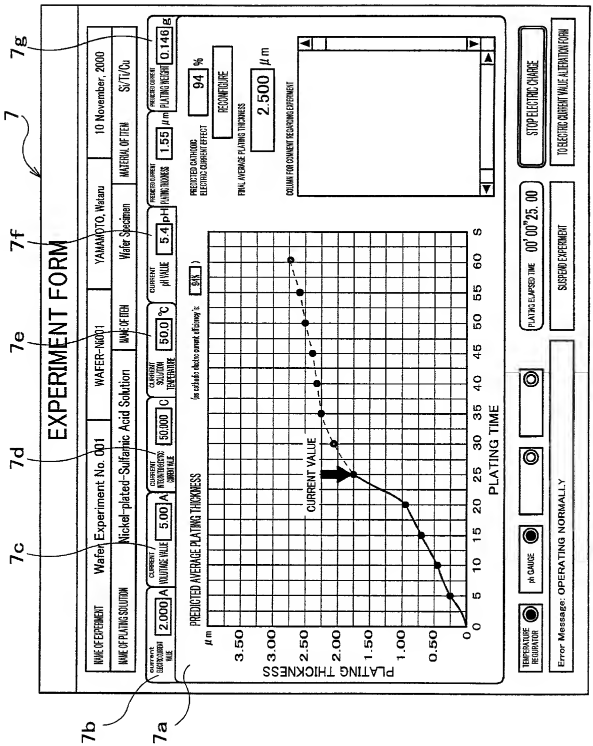
EXPERIMENT FORM
NAME OF EXPERIMENT
Wafer Experiment No. 001
WAFER-Ni001
YAMAMOTO, Wataru
10 November, 2000
NAME OF PLATING SOLUTION
Nickel-plated-Sulfamic Acid Solution
NAME OF ITEM
Wafer Specimen
MATERIAL OF ITEM
Si/Ti/Cu
current ELECTRIC CURRENT VALUE
2.000 A
CURRENT VOLTAGE VALUE
5.00 A
CURRENT INTEGRATED ELECTRIC CURRENT VALUE
50.000 C
CURRENT SOLUTION TEMPERATURE
50.0 °C
CURRENT pH VALUE
5.4 pH
PREDICTED CURRENT PLATING THICKNESS
1.55 μm
PREDICTED CURRENT PLATING WEIGHT
0.146 g
PREDICTED AVERAGE PLATING THICKNESS
(as cathode electric current efficiency is 94%)
PREDICTED CATHODIC ELECTRIC CURRENT EFFECT
94 %
RECONFIGURE
FINAL AVERAGE PLATING THICKNESS
2.500 μm
COLUMN FOR COMMENT REGARDING EXPERIMENT
μm
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0
PLATING THICKNESS
0
5
10
15
20
25
30
35
40
45
50
55
60
S
PLATING TIME
CURRENT VALUE
STOP ELECTRIC CHARGE
TO ELECTRIC CURRENT VALUE ALTERATION FORM
PLATING ELAPSED TIME
00' 00" 25. 00
SUSPEND EXPERIMENT
TEMPERATURE REGURATOR
ph GAUGE
Error Message: OPERATING NORMALLY
7
7a
7b
7c
7d
7e
7f
7g

FIG.8

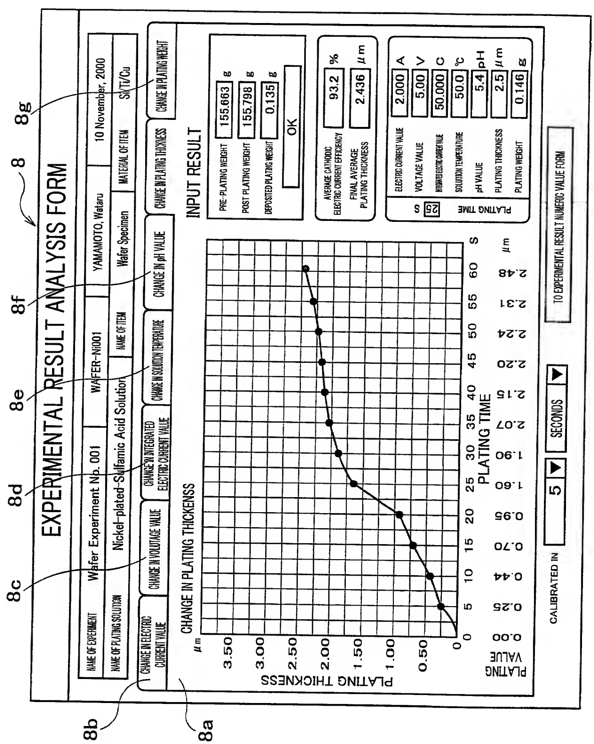
8
8a
8b
8c
8d
8e
8f
8g
EXPERIMENTAL RESULT ANALYSIS FORM
NAME OF EXPERIMENT
Wafer Experiment No. 001
WAFER-Ni001
YAMAMOTO, Wataru
10 November, 2000
NAME OF PLATING SOLUTION
Nickel-plated-Sulfamic Acid Solution
NAME OF ITEM
Wafer Specimen
MATERIAL OF ITEM
Si/Ti/Cu
CHANGE IN ELECTRIC CURRENT VALUE
CHANGE IN VOLTAGE VALUE
CHANGE IN INTEGRATED ELECTRIC CURRENT VALUE
CHANGE IN SOLUTION TEMPERATURE
CHANGE IN pH VALUE
CHANGE IN PLATING THICKNESS
CHANGE IN PLATING WEIGHT
CHANGE IN PLATING THICKENSS
PLATING THICKNESS
μm
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0
0 5 10 15 20 25 30 35 40 45 50 55 60 S
PLATING TIME
PLATING VALUE
0.00 0.25 0.44 0.70 0.95 1.60 1.90 2.07 2.15 2.20 2.24 2.31 2.48 μm
CALIBRATED IN
5
SECONDS
TO EXPERIMENTAL RESULT NUMERIC VALUE FORM
INPUT RESULT
PRE-PLATING WEIGHT 155.663 g
POST PLATING WEIGHT 155.798 g
DEPOSITED PLATING WEIGHT 0.135 g
OK
AVERAGE CATHODIC ELECTRIC CURRENT EFFICIENCY 93.2 %
FINAL AVERAGE PLATING THICKNESS 2.436 μm
PLATING TIME 25 S
ELECTRIC CURRENT VALUE 2.000 A
VOLTAGE VALUE 5.00 V
INTEGRATED ELECTRIC CURRENT VALUE 50.000 C
SOLUTION TEMPERATURE 50.0 °c
pH VALUE 5.4 pH
PLATING THICKNESS 2.5 μm
PLATING WEIGHT 0.146 g

FIG.9

9

EXPERIMENTAL RESULT NUMERICAL VALUE FORM

NAME OF EXPERIMENT	Wafer Experiment No. 001	WAFER-Ni001	YAMAMOTO, Wataru	10 November, 2000
NAME OF PLATING SOLUTION	Nickel-plated-Sulfamic Acid Solution	NAME OF ITEM: Wafer Specimen	MATERIAL OF ITEM: Si/Ti/Cu	

PLATING TIME(S)	ELECTRIC CURRENT VALUE(A)	VOLTAGE VALUE(V)	INTEGRATED ELECTRIC CURRENT VALUE(A)	SOLUTION TEMPERATURE(°C)	pH VALUE(pH)	PLATING THICKNESS(μm)	PLATING WEIGHT(g)
0	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
1	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
2	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
3	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
4	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
5	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
6	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
7	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
8	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
9	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
10	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
11	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
12	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
13	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
14	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
15	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
16	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
17	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
18	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
19	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
20	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
21	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
22	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
23	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
24	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
25	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
26	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
27	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
28	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
29	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
30	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
31	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

SAVE IN CSV FORMAT